In the Claims

1   1.   (currently amended) A photonic crystal waveguide for coupling with optic

2   devices comprising:

3   a planar photonic crystal slab in which an array of holes is defined; and

4   a waveguide defined by a line defect defined in the array of holes in said slab,

5   said line defect being created by a geometric perturbation of at least a first set of holes

6   in the array with respect to a second set of holes in the array to create at least one

7   guided mode of light propagation in said waveguide which exhibits reduced vertical and

8   lateral losses, increased coupling of light into said slab, and closer matching of

9   frequencies of eigen modes of said optic devices coupled to said waveguide.

1   2.   (original) The waveguide of claim 1 where said geometric perturbation is a

2   positional displacement of said first set of holes with respect to said second set of holes

3   in a predetermined direction, said first and second set of holes having the same

4   diameter of hole therein.

1   3.   (original) The waveguide of claim 1 where said predetermined direction is the ΓX

2   direction in said slab, said waveguide being defined as a type 1 waveguide.

1   4.   (original) The waveguide of claim 1 where said predetermined direction is the ΓJ

2   direction in said slab, said waveguide being defined as a type 2 waveguide.

1 5.   (original) The waveguide of claim 4 where said positional displacement, d, is a

2 fraction, l, of lattice spacing, a, of said array, d = l ∘ a, where 0 < l < 1.

1 6.   (original) The waveguide of claim 5 where d = 0.5a.

1 7.   (original) The waveguide of claim 5 where said waveguide has a bandgap and

2 where d is reduced until both acceptor-type modes and donor-type modes are

3 positioned in the bandgap of said waveguide.

1 8.   (original) The waveguide of claim 1 where said slab has a bandgap, an air band

2 and a dielectric band for propagation of modes and where said geometric perturbation is

3 created by displacement of holes into a positions within said array of holes where

4 dielectric is normally present to pull modes from the dielectric band into the bandgap.

1 9.   (original) The waveguide of claim 1 where said slab has a bandgap, an air band

2 and a dielectric band for propagation of modes and where said geometric perturbation is

3 created by displacement of dielectric into a positions within said array of holes where air

4 is normally present to pull modes from the air band into the bandgap.

1 10.   (currently amended) The waveguide of claim 1 where said geometric

2 perturbation is created by increasing or decreasing the diameter of a̶ the first set of

3 holes in said array of holes relative to a̶ the second set of holes comprising a remainder

4   of holes of said array, said first set of holes being adjacent at least in part to said line

5   defect, said waveguide defined as a type-3 waveguide.

1   11.   (original) The waveguide of claim 10 where slab has a bandgap and an air band

2   and where second set of holes has a radius, r = 0.3a and said first set of holes has a

3   radius, r_{defect} = 0.2a and said array of holes has a triangular lattice so that only air band

4   modes are pulled down in the bandgap and no acceptor-type modes are present.

1   12.   (original) The waveguide of claim 10 where slab has a bandgap and an air band

2   and where second set of holes has a radius, r = 0.3a and said first set of holes has a

3   radius, r_{defect} = 0.45a and said array of holes has a triangular lattice so that only

4   acceptor-type modes are present.

1   13.   (original) The waveguide of claim 1 where said light is guided in said waveguide

2   due to photonic bandgap (PBG) effect.

1   14.   (original) A method for defining a photonic crystal waveguide for coupling with

2   optic devices comprising:

3   defining an array of holes in a planar photonic crystal slab; and

4   creating a line defect in said slab to define said waveguide, said line defect being

5   created by a geometric perturbation of at least a first set of holes with respect to a

6   second set of holes to create at least one guided mode of light propagation in said

4

7   waveguide which exhibits reduced vertical and lateral losses, increased coupling of light

8   into said slab, and closer matching of frequencies of eigen modes of said optic devices

9   coupled to said waveguide.

1   15.   (original) The method of claim 14 where creating said line defect comprises

2   forming said first set of holes displaced in a predetermined direction with respect to said

3   second set of holes, said first and second set of holes having the same diameter of hole

4   therein.

1   16.   (original) The method of claim 14 where forming said first set of holes displaces

2   said holes in the ΓX direction in said slab, said waveguide being defined as a type 1

3   waveguide.

1   17.   (original) The method of claim 14 where forming said first set of holes displaces

2   said holes in the ΓJ direction in said slab, said waveguide being defined as a type 2

3   waveguide.

1   18.   (original) The waveguide of claim 17 where forming said first set of holes

2   displaces said holes by a displacement, d, is a fraction, I, of lattice spacing, a, of said

3   array, $d = I \cdot a$, where $0 < I < 1$.

1   19.   (original) The method of claim 18 where forming said first set of holes displaces

2   said holes by a displacement, d = 0.5.

1   20.   (original) The method of claim 18 where said waveguide has a bandgap and

2   where forming said first set of holes displaces said holes by a d which is reduced until

3   both acceptor-type modes and donor-type modes are positioned in the bandgap of said

4   waveguide.

1   21.   (original) The method of claim 14 where said slab has a bandgap, an air band

2   and a dielectric band for propagation of modes and where creating said line defect

3   comprises forming said first set of holes displaced by displacement of holes into

4   positions within said array of holes where dielectric is normally present to pull modes

5   from the dielectric band into the bandgap.

1   22.   (original) The method of claim 14 where said slab has a bandgap, an air band

2   and a dielectric band for propagation of modes and where creating said line defect

3   comprises forming said first set of holes displaced by displacement of holes into

4   positions within said array of holes where air is normally present to pull modes from the

5   air band into the bandgap.

1   23.   (currently amended) The method of claim 1 14 where creating said line defect

2   comprises increasing or decreasing the diameter of a the first set of holes in said array

3   of holes relative to a̶ the second set of holes comprising a remainder of holes of said

4   array, said first set of holes being adjacent at least in part to said line defect, said

5   waveguide defined as a type-3 waveguide.

1   24.   (original) The method of claim 23 where slab has a bandgap and an air band and

2   where creating said line defect comprises decreasing the diameter of a first set of holes

3   to a radius, r_{defect} = 0.2a and said second set of holes has a radius, r = 0.3a and said

4   first set of holes has said array of holes has a triangular lattice so that only air band

5   modes are pulled down in the bandgap and no acceptor-type modes are present.

1   25.   (original) The method of claim 23 where slab has a bandgap and an air band and

2   where creating said line defect comprises increasing the diameter of a first set of holes

3   to a radius r_{defect} = 0.45a, where second set of holes has a radius, r = 0.3a, and said

4   array of holes has a triangular lattice so that only acceptor-type modes are present.

1   26.   (currently amended) The method of claim 1̶ 14 where creating said line defect

2   comprises guiding light in said waveguide solely due to photonic bandgap (PBG) effect.